Chapter B2: Cost Impact Analysis

INTRODUCTION

This chapter presents an assessment of the magnitude of compliance costs associated with implementing the Final Section 316(b) Phase II Existing Facilities Rule, including a cost-to-revenue analysis at the facility and firm levels, an analysis of compliance costs per household at the North American Electric Reliability Council (NERC) level, and an analysis of compliance costs relative to electricity price projections, also at the NERC level.[1] Later chapters consider the potential energy effects of the final rule on regional energy markets and facilities subject to Phase II regulation (*Chapter B3: Electricity Market Model Analysis*), impacts on small entities (*Chapter B4: Regulatory Flexibility Analysis*), and impacts on governments (*Chapter B5: UMRA Analysis*).

B2-1 COST-TO-REVENUE MEASURE

The "cost-to-revenue measure" is used to assess the magnitude of compliance costs relative to revenues. The cost-to-revenue measure is a useful test because it compares the cost of reducing adverse environmental impact from the operation of the facility's cooling water intake structure (CWIS) with the economic value (i.e., revenue) of the facility's economic activities. EPA conducted this test at the facility and firm levels.

Annualized compliance costs include all capital costs, operating and maintenance (O&M) costs, administrative costs, and plant outage costs of compliance with the final Phase II rule. To derive the constant annual value of the technology capital costs, the initial permitting cost, and the value of construction and/or connection plant outage, EPA annualized them over 10 or 30 years, using a seven percent discount rate. EPA then added the annualized capital and connection outage costs to annual O&M costs, and administrative costs to derive each facility's total annual cost of complying with the final Phase II rule.[2] For a detailed analysis of the compliance cost components developed for this analysis, see *Chapter B1: Summary of Compliance Costs* and the *§ 316(b) Technical Development Document* (U.S. EPA, 2004).

EPA compared the annualized compliance costs to the estimated facility and firm revenues. This analysis uses impact thresholds of 1.0 and 3.0 percent.

B2-1.1 Facility Analysis

EPA compared the annualized post-tax compliance costs of the final rule as a percentage of annual revenues for each of the 543 surveyed in-scope facilities. EPA used facility-specific baseline revenue projections from ICF Consulting's Integrated Planning Model (IPM®) for 2008 for this analysis. The IPM did not provide revenues for 16 facilities. Eight of these facilities are estimated to be baseline closures and another eight facilities are not modeled by the IPM. In addition, five facilities are projected by IPM to have zero revenues in the baseline. EPA used facility-specific electricity generation and firm-specific wholesale prices as reported to the Energy Information Administration (EIA) to calculate the cost-to-revenue

[1] It should be noted that these measures are intended to give an indication of the magnitude of compliance costs. These measures are not used to predict closures or other types of economic impacts on facilities subject to the final Phase II rule. EPA did not rely on any one of these measures to assess the magnitude of costs.

[2] This annualization methodology is different from that conducted for the national cost estimate presented in *Chapter B1: Summary of Compliance Costs*. For the national cost estimate, the present value was determined as of the first year the Phase II rule will take effect (2004). In contrast, for the impact analysis, the present value was determined as of the first year of compliance of each facility (for this analysis, assumed to be 2005 to 2009).

ratio for the 13 non-baseline closure facilities with missing information. EPA then applied sample weights to the 543 facilities to account for non-sampled facilities and facilities that did not respond to the survey.

Table B2-1 below presents the results of the facility-level cost-to-revenue measure conducted for the 554 electric generating facilities subject to the final Phase II rule, by facility ownership type and fuel type. For each facility type the table presents (1) the total number of facilities; (2) the number of facilities with a cost-to-revenue ratio of less than 0.5 percent, between 0.5 and one percent, between one and three percent, greater than three percent, and the number of facilities estimated to be baseline closures; and (3) the minimum and maximum ratio.

Table B2-1: Facility-Level Cost-to-Revenue Measure

Facility Type	Total Number of Facilities	Number of Facilities with a Ratio of					Minimum Ratio	Maximum Ratio
		<0.5%	0.5 -1%	1 - 3%	> 3%	Baseline Closure		
By Ownership Type								
Investor-Owned Utility	274	179	52	27	15	1	0.01%	81.7%
Nonutility	179	94	36	35	8	6	0.01%	12.2%
Federal Utility	14	12	1	1	0	0	0.05%	1.9%
State-Owned Utility	7	3	1	1	2	0	0.03%	3.8%
Municipality	48	14	4	20	10	0	0.03%	63.3%
Political Subdivision	7	4	0	1	1	1	0.05%	19.0%
Rural Electric Cooperative	25	8	5	9	3	0	0.03%	8.9%
Total[a]	**554**	**314**	**99**	**94**	**39**	**8**	**0.01%**	**81.7%**
By Fuel Type								
Coal	302	189	67	38	8	0	0.01%	21.1%
Combined-Cycle	17	10	3	2	2	0	0.01%	5.6%
Nuclear	59	43	1	6	2	7	0.01%	4.3%
Oil and Gas Steam	168	72	28	41	25	1	0.02%	81.7%
Other Steam	8	0	0	7	1	0	1.20%	4.0%
Total[a]	**554**	**314**	**99**	**94**	**39**	**8**	**1.20%**	**81.7%**

[a] Individual numbers may not add up due to independent rounding.

Source: IPM analysis: model run for Section 316(b) base case, 2008, EPA electricity demand assumptions; U.S. EPA analysis, 2004.

Table B2-1 shows that the vast majority of facilities subject to the final Phase II rule incur low compliance costs when compared to facility-level revenues. Out of the 554 facilities subject to the final Phase II rule, 413, or approximately 75 percent, incur annualized costs of less than 1.0 percent of revenues. Of these, 314, or approximately 57 percent, incur annualized costs of less than 0.5 percent of revenues. Ninety-four facilities, or 17 percent are estimated to incur costs of between 1.0 and 3.0 percent of revenues, and 39 facilities, or 7 percent, are estimated to incur costs of greater than 3.0 percent. Eight facilities are estimated to be baseline closures.

An investor-owned facility is estimated to experience the highest compliance cost compared to projected revenues, 81.7 percent. In addition, investor-owned utilities are the group with the highest number of facilities (15) with a cost-to-revenue ratio greater than 3.0. However, State-owned utilities have the highest percentage of facilities with a cost-to-revenue ratio greater than 3.0, two out of seven, or 29 percent. By fuel type, oil and gas steam electric generators experience the greatest

incidence of compliance costs to revenues: 25 of 168 facilities, or 14.9 percent, are estimated to have a cost-to-revenue ratio of greater than 3.0 percent.

B2-1.2 Firm Analysis

The facility-level analysis above showed that compliance costs are generally low compared to facility-level revenues. However, impacts experienced at the firm-level may be more significant for firms that own multiple facilities subject to the final Phase II rule. EPA therefore also analyzed the firm-level cost-to-revenue ratios of the final Phase II rule.

EPA first identified the domestic parent entity of each in-scope Phase II facility (for a detailed description of this analysis, see *Chapter B4: Regulatory Flexibility Analysis*). From this analysis, EPA determined that 126 unique domestic parent entities own the facilities subject to the final Phase II regulation. EPA obtained the sales revenues for the 126 domestic parent entities from publicly available data sources (the 1999, 2000, and 2001 Forms EIA-861; the Dun and Bradstreet database; company 10-K filings; and entities' websites). The firm-level analysis is based on the ratio of the aggregated post-tax compliance costs for each facility owned by the 126 parent entities to the firm's total sales revenue. EPA identified 71 entities, out of the 126 unique domestic parent entities, that own more than one facility subject to the final Phase II rule.

Table B2-2 below summarizes the results of the cost-to-revenue measure conducted for the 126 entities owning in-scope electric generating facilities by the parent entity type. For each entity type the table presents (1) the total number of facilities owned; (2) the total number of firms; (3) the number of firms with a cost-to-revenue ratio of less than 0.5 percent, between 0.5 and one percent, between one and three percent, greater than three percent; and (4) the minimum and maximum ratio.

Table B2-2: Firm-Level Cost-to-Revenue Measure by Entity Type

Entity Type	Total Number of Facilities	Total Number of Firms	Number of Firms with a Ratio of				Minimum Ratio	Maximum Ratio
			<0.5%	0.5- 1%	1 - 3%	> 3%		
Investor-Owned Utility	274	41	39	2	0	0	0.00%	0.6%
Nonutility	179	26	25	1	0	0	0.01%	0.8%
Federal Utility	14	1	1	0	0	0	0.17%	0.2%
State-Owned Utility	7	4	4	0	0	0	0.04%	0.3%
Municipality	48	36	20	6	9	1	0.03%	6.7%
Political Subdivision	7	3	2	0	1	0	0.09%	1.0%
Rural Electric Cooperative	25	15	14	1	0	0	0.12%	0.6%
Total[a]	**554**	**126**	**105**	**10**	**10**	**1**	**0.00%**	**6.7%**

[a] Individual numbers may not add up to totals due to independent rounding.

Source: U.S. EPA analysis, 2004.

EPA estimates that the compliance costs will comprise a very low percentage of firm-level revenues. Of the 126 parent entities with facilities subject to the final Phase II rule, 115, or approximately 91 percent, incur annualized costs of less than 1.0 percent of revenues. Of these, 105, or approximately 83 percent, incur annualized costs of less than 0.5 percent of revenues. Ten entities incur costs of between 1.0 and 3.0 percent of revenues and only one entity incurs costs of greater than 3.0 percent. EPA estimates that one entity only owns an in-scope facility, which is projected to be a baseline closure. The compliance cost incurred by this entity is less than 0.5 percent of revenues. Overall, the estimated annualized compliance costs represent between less than 0.01 and 6.7 percent of the entities' annual sales revenue.

At the firm level, municipalities are estimated to experience the highest cost-to-revenue ratios. Ten out of eleven firms with ratios of greater than 1.0 percent are municipalities. In addition, municipalities experience the highest cost-to-revenue ratio of all parent types, 6.7 percent.

B2-2 Cost Per Household

EPA also conducted an analysis that evaluates the potential cost per household, if Phase II facilities were able to pass compliance costs on to their customers.[3] This analysis estimates the average compliance cost per household for each North American Electric Reliability Council (NERC) region, using two data inputs: (1) the average annual compliance cost per megawatt hour (MWh) of sales and (2) the average annual MWh of electricity sales per household.[4] Both data elements were calculated by NERC region using the following approach:

- ***Average annual compliance cost per MWh of sales:*** EPA compiled data on total electricity sales (including residential, commercial, industrial, public street highway and lighting, and other sales) from the 2001 Form EIA-861 database. Utility-level sales were aggregated by NERC region to derive each region's total electricity sales in 2001. In addition, EPA aggregated the national pre-tax compliance costs by the NERC region in which the 554 Phase II facilities are located. The average compliance cost per MWh of electricity sales is calculated by dividing total pre-tax compliance costs by total electricity sales for each region.

- ***Average annual electricity sales per household:*** Form EIA-861 differentiates electricity sales by customer type and also presents the number of customers that account for the sales. The average annual electricity sales per household is therefore calculated by dividing the MWh of residential sales by the number of households. This calculation was again done by NERC region.

EPA calculated the annual cost of the final rule per household by multiplying the average annual compliance cost per MWh of sales by the average annual electricity sales per household. This analysis assumes that power generators pass costs on to consumers, on a dollar-to-dollar basis, and that each sector (i.e., residential, industrial, commercial, public street highway and lighting, and other) bears an equal burden of compliance costs per MWh of electricity. This analysis also assumes that there will be no reduction in electricity consumption by the consumers in response to price increases.

Table B2-3 shows the results of this analysis: the estimated cost per residential consumer ranges from $0.50 per year in Alaska (ASCC) to $8.18 per year in Hawaii (HI). The U.S. average cost per residential household is $1.21 per year.

[3] The number of residential consumers reported in Form EIA-861 is based on the number of utility meters. This is a proxy for the number of households but can differ slightly due to bulk metering in some multi-family housing.

[4] For a detailed discussion of NERC regions see Chapter A3, *Profile of the Electric Power Industry*, section A3-2.3.

Table B2-3: Annual Compliance Cost per Residential Consumer by NERC Region in 2001

NERC Region [a]	Total National Pre-Tax Compliance Cost	Total Electricity Sales (MWh)	Annualized Pre-Tax Compliance Cost ($ / MWh Sales)	Residential Electricity Sales (MWh)	Number of Households	Annual Residential Sales/ Consumer (MWh)	Annual Compliance Cost/ Residential Consumer
ASCC	$337,442	5,427,689	$0.06	1,891,468	234,646	8.06	$0.50
ECAR	$76,413,402	504,256,959	$0.15	161,442,646	15,698,205	10.28	$1.56
ERCOT	$20,921,310	280,585,786	$0.07	105,198,123	7,309,073	14.39	$1.07
FRCC	$27,281,223	186,616,722	$0.15	94,834,627	6,885,280	13.77	$2.01
HI	$10,095,493	9,370,360	$1.08	2,665,168	351,229	7.59	$8.18
MAAC	$39,826,208	235,576,827	$0.17	82,687,782	8,921,106	9.27	$1.57
MAIN	$31,880,030	257,913,569	$0.12	75,925,257	8,366,132	9.08	$1.12
MAPP	$11,833,570	139,610,505	$0.08	49,125,931	4,933,221	9.96	$0.84
NPCC	$54,991,490	253,142,223	$0.22	87,587,585	12,676,283	6.91	$1.50
SERC	$63,409,419	748,160,887	$0.08	278,450,252	20,550,922	13.55	$1.15
SPP	$11,291,028	172,750,800	$0.07	60,173,420	5,002,020	12.03	$0.79
WSCC	$36,821,337	571,981,463	$0.06	200,686,234	23,085,962	8.69	$0.56
U.S.	**$385,101,952**	**3,365,393,790**	**$0.11**	**1,200,668,493**	**114,014,079**	**10.53**	**$1.21**

Key to NERC regions: ASCC – Alaska Systems Coordinating Council; ECAR – East Central Area Reliability Coordination Agreement; ERCOT – Electric Reliability Council of Texas; FRCC – Florida Reliability Coordinating Council; HI – Hawaii; MAAC – Mid-Atlantic Area Council; MAIN – Mid-America Interconnect Network; MAPP – Mid-Continent Area Power Pool; NPCC – Northeast Power Coordinating Council; SERC – Southeastern Electric Reliability Council; SPP – Southwest Power Pool; WSCC – Western Systems Coordinating Council.

Source: U.S. DOE, 2001; U.S. EPA analysis, 2004.

B2-3 Electricity Price Analysis

EPA also considered potential effects of the final Phase II rule on electricity prices. EPA used three data inputs in this analysis: (1) total pre-tax compliance cost incurred by facilities subject to the final rule; (2) total electricity sales, based on the Annual Energy Outlook (AEO) 2003; and (3) prices by consumer type (residential, commercial, industrial, and transportation), also from the AEO 2003. All three data elements were calculated by NERC region.[5]

Table B2-4 shows the annualized costs of complying with the final Phase II rule, total electricity sales (MWh), and the cost in cents per kilowatt hour (KWh) of total electricity sales by NERC region. The costs range from 0.007 cents per KWh sales in SPP to 0.019 cents per KWh sales in NPCC. The U.S. average is estimated to be 0.011 cents per KWh sales.

Table B2-4: Compliance Cost per KWh of Sales by NERC Region

NERC Region	Annualized Pre-Tax Compliance Costs (National; $2002)	Total Electricity Sales (MWh; 2001)	Annualized Pre-Tax Compliance Cost (Cents / KWh Sales)
ASCC	$337,442	---	---
ECAR	$76,413,402	508,632,996	¢0.015
ERCOT	$20,921,310	269,572,052	¢0.008
FRCC	$27,281,223	186,505,005	¢0.015
HI	$10,095,493	---	---
MAAC	$39,826,208	243,576,004	¢0.016
MAIN	$31,880,030	231,183,029	¢0.014
MAPP	$11,833,570	150,737,030	¢0.008
NPCC	$54,991,490	282,686,981	¢0.019
SERC	$63,409,419	756,352,051	¢0.008
SPP	$11,291,028	167,893,982	¢0.007
WSCC	$36,821,337	223,035,996	¢0.017
U.S.	**$385,101,952**	**3,397,995,361**	**¢0.011**

Source: U.S. DOE, 2003; U.S. EPA analysis, 2004.

To determine potential effects on electricity prices as a result of the final rule, EPA compared the compliance cost per KWh of sales, presented in Table B2-4, to baseline electricity prices. Table B2-5 shows the annualized pre-tax compliance cost in cents per KWh of electricity sales and the AEO projected electricity prices for each consumer type. In addition, the table presents the price increases by consumer type that are estimated to result from the final Phase II rule. The largest potential increase in electricity prices is 0.49 percent (¢0.017 / ¢3.39) for an industrial facility in WSCC. The average increase in electricity prices is only estimated to be between 0.13 percent (¢0.011 / ¢8.58) for households and 0.24 percent (¢0.011 / ¢4.77) for industrial customers.

This analysis assumes that power generators fully recover compliance costs from consumers and that each sector (i.e., residential, commercial, industrial, and transportation) bears an equal burden of compliance costs per MWh of purchased electricity.

[5] The Annual Energy Outlook does not include two NERC regions, ASCC and HI.

Table B2-5: Estimated Price Increase as a Percent of 2001 Prices by Consumer Type and NERC Region[a]

Region	Annualized Pre-Tax Compliance Cost (Cents / KWh Sales)	Residential		Commercial		Industrial		Transportation		All Sectors Average	
		Price	% Change	Price	% Change	Price	% Change	Price	% Change	Price	% Change
ECAR	¢0.015	¢7.54	0.20%	¢6.54	0.23%	¢4.17	0.36%	¢6.16	0.24%	¢5.92	0.25%
ERCOT	¢0.008	¢8.15	0.10%	¢7.67	0.10%	¢4.57	0.17%	¢7.10	0.11%	¢6.94	0.11%
FRCC	¢0.015	¢8.68	0.17%	¢7.14	0.20%	¢5.39	0.27%	¢7.70	0.19%	¢7.80	0.19%
MAAC	¢0.016	¢9.09	0.18%	¢7.75	0.21%	¢6.32	0.26%	¢7.88	0.21%	¢7.92	0.21%
MAIN	¢0.014	¢7.79	0.18%	¢6.58	0.21%	¢4.28	0.32%	¢6.45	0.21%	¢6.24	0.22%
MAPP	¢0.008	¢7.07	0.11%	¢5.95	0.13%	¢3.99	0.20%	¢5.93	0.13%	¢5.60	0.14%
NPCC	¢0.019	¢12.98	0.15%	¢10.45	0.19%	¢6.56	0.30%	¢10.48	0.19%	¢10.57	0.18%
SERC	¢0.008	¢7.70	0.11%	¢6.67	0.13%	¢4.23	0.20%	¢6.64	0.13%	¢6.27	0.13%
SPP	¢0.007	¢7.58	0.09%	¢6.38	0.11%	¢4.15	0.16%	¢6.04	0.11%	¢6.18	0.11%
WSCC	¢0.017	¢6.50	0.25%	¢6.15	0.27%	¢3.39	0.49%	¢5.93	0.28%	¢5.28	0.31%
U.S.	**¢0.011**	**¢8.58**	**0.13%**	**¢7.85**	**0.14%**	**¢4.77**	**0.24%**	**¢7.39**	**0.15%**	**¢7.21**	**0.16%**

[a] Prices are in cents per KWh.

Source: U.S. EPA analysis, 2004.

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